

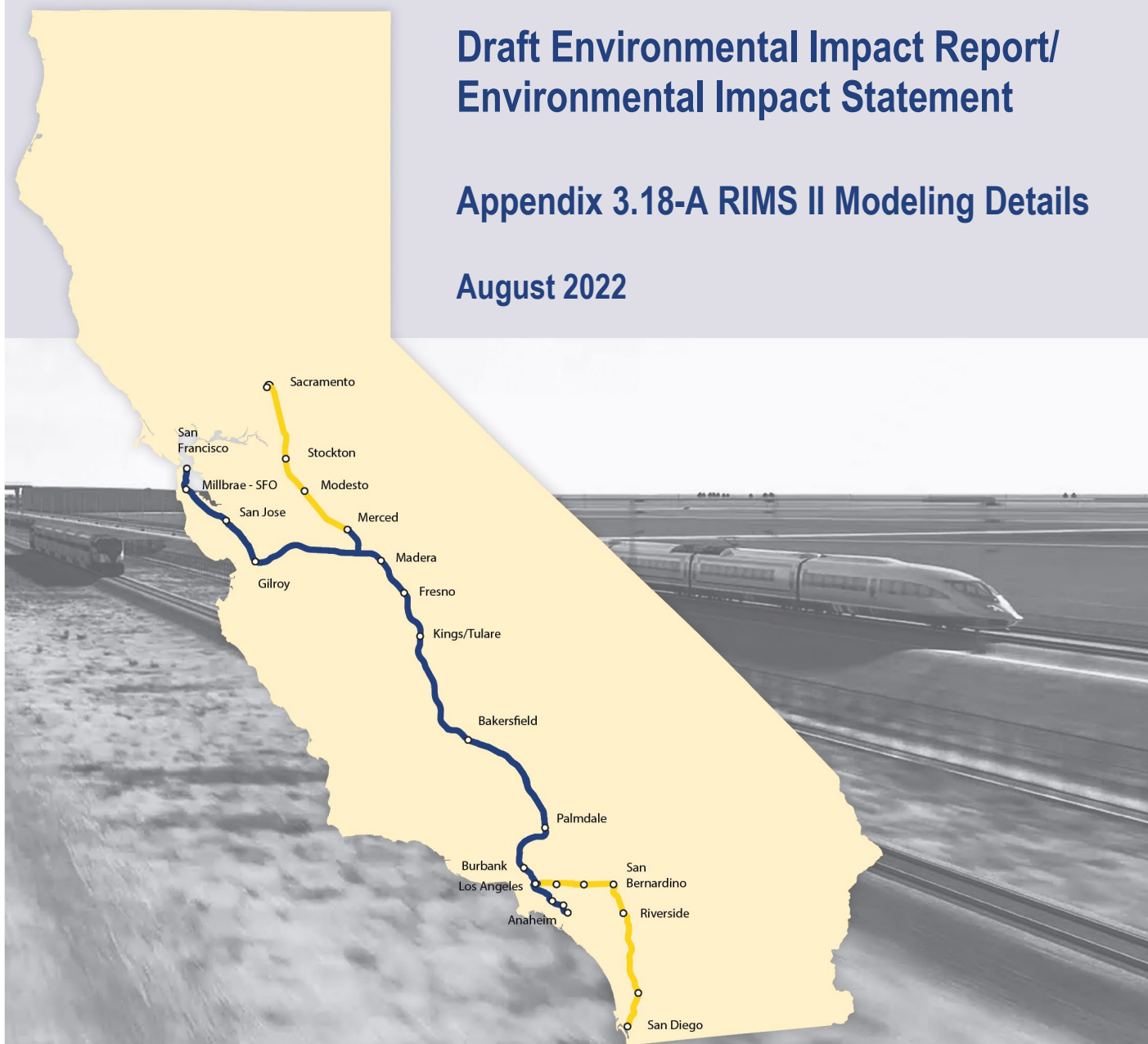
California High-Speed Rail Authority

Palmdale to Burbank *Project Section*

Draft Environmental Impact Report/
Environmental Impact Statement

Appendix 3.18-A RIMS II Modeling Details

August 2022



The environmental review, consultation, and other actions required by applicable federal environmental laws for this project are being or have been carried out by the State of California pursuant to 23 U.S.C. 327 and a Memorandum of Understanding dated July 23, 2019, and executed by the Federal Railroad Administration and the State of California.

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APPENDIX 3.18-A: RIMS II MODELING DETAILS

This appendix presents the methodology and results of the Regional Input-Output Modeling System (RIMS II) modeling supporting the analysis presented in Section 3.18, Regional Growth. Overall, the analysis finds that construction and operation of the High-Speed Rail (HSR) Palmdale to Burbank Project Section (Project Section or project) would have a positive economic effect on the resource study area (RSA), which is composed of Los Angeles County.

1 SUMMARY OF FINDINGS

The estimate of total capital costs for the Palmdale to Burbank Project Section is approximately \$22.4 to \$24 billion (2018 dollars) in the RSA, depending on the Build Alternative. The SR14A Build Alternative would have the highest cost and highest employment impact, but this cost estimate is only about five percent greater than the E1 Build Alternative, which would have the lowest cost and employment impact. During the peak year of construction (Year 4 / 2023), direct spending is estimated to support between approximately 7,800 and 8,000 construction construction-related job years (full-time equivalents), depending on the Build Alternative.

Spending and employment associated with operations is not expected to vary substantially among the Build Alternatives due to similar lengths and the same number of stations. In total, the project would annually support an estimated 490 direct, indirect, and induced jobs.

2 ANALYSIS FRAMEWORK AND APPROACH

The economic impacts calculated and reported in this appendix are directly linked to spending attributable to the project and are considered using an accepted economic metrics of economic output, employment, and employee compensation. HSR-related expenditures on goods and services from within the economy of the RSA create a multiplier effect as local and regional businesses that supply inputs to production generate successive rounds of spending. Employment supported by HSR also generates a multiplier effect through household spending in the economy of the RSA. HSR contributes to economic vitality and the quality of life through improved access and connectivity throughout the state.

2.1 Input-Output Analysis Overview

Input-Output (I/O) analysis is based on the concept that industries in a geographic region are interdependent and thus the total contribution of any one establishment's activity is larger than its individual (direct) output or employment. Consequently, an establishment's economic activity has a multiplier effect that generates successive rounds of spending and output in other economic sectors within a particular region. For example, construction firms purchase goods from producers, who in turn purchase raw materials from suppliers. Thus, an increase or decrease in the demand for construction supplies would stimulate an increase or decrease in output and employment in interdependent secondary industries.

Regional economic impact analysis and I/O models in particular provide a means to quantify economic effects stemming from a particular industry or economic activity. I/O models produce quantitative estimates of the magnitude of regional economic activity resulting from some initial activity. I/O models rely on economic multipliers that mathematically represent the relationship between the initial change in one sector of the economy and the effect of that change on employment, income, economic output, and value added in other regional industries specific to the defined region. These economic data provide a quantitative estimate of the magnitude of shifts in jobs and revenues within that region's economy.

The analysis begins with an estimate of the initial economic input associated with HSR expenditures on capital investment and operations in the economy of the RSA. These initial inputs are referred to as the direct effect. Next the I/O model quantifies the impacts associated with the multiplier effects that result from that initial economic input. Multiplier effects include indirect or induced effects. Indirect effects represent economic impacts on suppliers while induced effects represent economic impacts on household income and spending. In this report, direct, indirect, and induced effects are defined as follows:

- **Direct Effect** – The economic value of the initial input of spending into the economy made by the Authority.
- **Indirect Effect** – The economic value of “upstream” industry-to-industry transactions that supply inputs to the production of goods and services consumed by the Authority.
- **Induced Effect** – The economic value of labor income that recirculates in the economy as a result of the initial expenditures made by the Authority.
- **Total Impact** – The sum of the direct, indirect, and induced effects. The total impact measures the overall impact of HSR activities within the region.

This analysis measures economic significance using common economic metrics, including output, employment, and employee compensation:

- **Employment**—Equivalent to jobs, a headcount that includes part-time and full-time workers.
- **Job Years**—A combined measure of total jobs and the length of time of those jobs. One job year is defined as equivalent to one job held by one person over one year’s duration. As an example, one job held by one worker for three years would constitute three job years; three jobs held by three workers for one year’s duration would also constitute three job years.

It should be noted that a portion of the impacts reported in this analysis may not be entirely net new. For example, it is plausible that the State of California could have spent a portion of its HSR budget on other projects elsewhere in the state if the HSR project did not occur and monies were not dedicated to the project.

2.2 RIMS II Multipliers

The U.S. Department of Commerce Bureau of Economic Analysis’ (BEA) Regional Input-Output Modeling System (RIMS II) multipliers and a bill-of-goods method were used to estimate employment over the construction period of the project. RIMS II multipliers are available at the county level and were obtained specifically for the RSA (Los Angeles County). The resulting estimate includes the number of direct jobs created as well as the indirect and induced employment. Direct employment refers to the jobs created to construct the project and primarily involves jobs created in the construction sector. Indirect employment refers to the jobs created in existing businesses in the RSA (e.g., material and equipment suppliers) that supply goods and services to project construction. Induced employment refers to jobs created in new or existing businesses (e.g., retail stores, gas stations, banks, restaurants, service companies) that supply goods and services to workers and their families. BEA RIMS II Type II annual regional economic final-demand multipliers were used to generate these estimates. Final-demand employment multipliers provide the total number of jobs created per \$1 million change in final demand.

Type II multipliers measure the economic impact of industries and household expenditures. Unlike Type I multipliers, which account for direct and indirect impacts, Type II multipliers include the induced impacts associated with the spending of earnings by labor (households) within a region. Therefore, these endogenous multipliers can be used to estimate the sum of direct, indirect, and induced impacts.

RIMS II multipliers in two industry aggregations are most directly relevant to the construction phase and the operations and maintenance phase of the project extent. For the construction phase, Industry Aggregation #7 (NAICS Industry Sector 23: Construction) multipliers are the most generally applicable for use with local construction cost estimates for the RSA, and are shown in Table 3.18-A-1.

Table 3.18-A-1 RIMS II Multipliers Relevant to Project Construction

Industry	Multiplier				Direct Effect
	Final Demand				
	Output ¹ (dollars)	Earnings ² (dollars)	Employment ³ (jobs)	Value-Added ⁴ (dollars)	Employment ⁵
7. Construction	1.8952	0.5193	10.6560	1.0331	1.9616

Source: BEA, 2017

Multipliers are based on the 2007 Benchmark Input-Output Table for the Nation and 2015 regional data. Industry List B identifies the industries corresponding to the entries.

¹ Represents the total dollar change in output that occurs in all industries for each additional dollar of output delivered to final demand by the industry corresponding to the entry.

² Represents the total dollar change in earnings of households employed by all industries for each additional dollar of output delivered to final demand by the industry corresponding to the entry.

³ Represents the total change in number of jobs that occurs in all industries for each additional 1 million dollars of output delivered to final demand by the industry corresponding to the entry. Because the employment multipliers are based on 2015 data, the output delivered to final demand is in 2015 dollars.

⁴ Represents the total dollar change in value added that occurs in all industries for each additional dollar of output delivered to final demand by the industry corresponding to the entry.

⁵ Represents the total change in number of jobs in all industries for each additional job in the industry corresponding to the entry.

For the operations and maintenance phase, Industry Aggregation #33 (NAICS Industry Sector 482: Rail Transportation) multipliers are the most generally applicable to O&M cost estimates for the RSA. These multipliers are shown in Table 3.18-A-2.

Table 3.18-A-2 RIMS II Multipliers Relevant to Project Operations and Maintenance

Industry	Multiplier				Direct Effect
	Final Demand				
	Output ¹ (dollars)	Earnings ² (dollars)	Employment ³ (jobs)	Value-Added ⁴ (dollars)	Employment ⁵
33. Rail Transportation	1.8319	0.3834	6.1627	0.9672	3.0560

Source: BEA, 2017

Multipliers are based on the 2007 Benchmark Input-Output Table for the Nation and 2015 regional data. Industry List B identifies the industries corresponding to the entries.

¹ Represents the total dollar change in output that occurs in all industries for each additional dollar of output delivered to final demand by the industry corresponding to the entry.

² Represents the total dollar change in earnings of households employed by all industries for each additional dollar of output delivered to final demand by the industry corresponding to the entry.

³ Represents the total change in number of jobs that occurs in all industries for each additional 1 million dollars of output delivered to final demand by the industry corresponding to the entry. Because the employment multipliers are based on 2015 data, the output delivered to final demand should be in 2015 dollars.

⁴ Represents the total dollar change in value added that occurs in all industries for each additional dollar of output delivered to final demand by the industry corresponding to the entry.

⁵ Represents the total change in number of jobs in all industries for each additional job in the industry corresponding to the entry.

2.3 Construction Cost Estimates

In addition to RIMS II multipliers, this analysis relies on detailed capital cost estimates. Capital cost estimates for RIMS II modeling were assembled from data provided in the Authority's 2016 Business Plan and updated interim capital cost estimates for the six Build Alternatives (Authority 2020). These sources itemize costs using the Authority's refinement of the Federal Railroad Administration's (FRA) Standard Cost Categories (SCC), which establish a consistent format for the reporting, estimating, and managing capital costs. The RIMS II modeling performed in support of the construction analysis for evaluating regional growth is based on a set of capital cost estimates that have since been revised and adjusted between approximately 4% and 10% less

(average of -6.6%). These revisions are relatively small and do not change the overall impact conclusions of the Palmdale to Burbank Draft EIR/EIS.

As shown in Table 3.18-A-3, total capital costs range from \$22.4 billion to \$24.1 billion (2018 dollars), depending on the Build Alternative. These costs include the total effort and materials to construct the project, including modifications to roadways required to accommodate grade-separated guideways. It should be noted that the capital cost estimate reflects only related infrastructure improvements and does not include costs associated with the No Project Alternative.

Right-of-way costs were estimated based on the preliminary design. However, as the design of the project evolves, the right-of-way limits will be reassessed to reflect refined property acquisition needs. As a result, property acquisition costs are estimated in broad categories (i.e., urban, suburban, and rural and by density level), based on local land values rather than relying on a parcel-by-parcel assessment at this phase of project development. Right-of-way costs include the estimated cost to acquire properties needed for the future right-of-way but do not include costs associated with temporary easements for construction that are assumed to be part of allocated contingencies added to right-of-way acquisition costs.

However, right-of-way costs are excluded from the construction costs shown in Table 3.18-A-3, because right-of-way acquisition costs would not substantially contribute to construction-related jobs. The construction costs also do not include acquiring vehicles because they are part of the California HSR System and are not associated with constructing individual project sections. Additionally, construction costs only include professional service costs for surveys, testing, investigation, and engineering inspection, and do not include finance charges. Local construction costs are estimates of the development budget expenditures within Los Angeles County. For a project of the scale and specialized requirements of the HSR, a substantial amount of manufacturing and fabrication of the system's components would likely occur outside of the RSA. The great majority of those costs are for the track infrastructure – track bed, viaducts & tunnels – construction, with the small remainder for the construction of the station and Maintenance Facility.

Table 3.18-A-3 Palmdale to Burbank Build Alternative Capital Costs by Standard Cost Category

Standard Cost Category ¹	Capital Costs by Build Alternative (\$2018 millions) ²					
	Refined SR14	SR14A	E1	E1A	E2	E2A
10 Track Structures & Track ²	\$12,723	\$13,568	\$13,267	\$13,867	\$13,526	\$14,086
20 Stations, Terminals, Intermodal ³	\$556	\$560	\$573	\$532	\$661	\$624
30 Support facilities: yards, shops, administration buildings ⁴	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
40 Sitework, Existing Improvements	\$4,946	\$5,472	\$4,459	\$4,607	\$4,074	\$4,139
50 Communications & Signaling	\$175	\$189	\$173	\$182	\$164	\$159
60 Electric Traction	\$249	\$256	\$237	\$238	\$213	\$214
70 Vehicles	Considered a systemwide cost and not included as part of individual Palmdale to Burbank Section Build Alternatives					
80 Professional Services	\$2,950	\$3,169	\$2,985	\$3,110	\$3,036	\$3,138
90 Unallocated Contingency (Project Reserves)	\$801	\$861	\$803	\$834	\$799	\$824
100 Finance Charges	Estimate to be developed prior to project construction					
Total Costs¹	\$22,400	\$24,075	\$22,497	\$23,370	\$22,473	\$23,184

Source: Appendix 6-B, Palmdale to Burbank Project Section: PEPD Record Set Capital Costs Estimate Report

1 Capital Cost estimates exclusive of all costs for SCC Category 70(Vehicles) and Category 100 (Financing); SCC Category 40 inputs for this analysis are also exclusive of right-of-way acquisition and land costs. Estimated costs for SCC 90 were allocated proportionally to estimated total construction costs.

2 Cost estimates for SCC Categories 10, 40, 50, and 60 plus proportional share of SCC Category 90 assumed as HSR total construction costs. BEA 23 construction expenditures are assumed as 41% of total construction costs for the purpose of RIMS calculations to estimate local construction expenditures.

3 Cost estimates for SCC Categories 20–30 plus proportional share of SCC Category 90 assumed as stations and maintenance facilities. BEA 23 construction expenditures are assumed as 41% of total construction costs for the purpose of RIMS calculations to estimate local construction expenditures.

4 The Palmdale to Burbank Project Section cost information does not include support facilities. See Appendix 6-A, High-Speed Rail Operating and Maintenance Cost for Use in EIR/EIS Project-Level Analysis for a discussion of the Maintenance Facility site.

Construction of the HSR tracks, stations, and Maintenance Facility is planned for the years 2020 through 2028 (Refined SR14, SR14A, E1, and E1A Build Alternatives) or 2029 (E2, and E2A Build Alternatives), with 2023 identified as the peak year of construction activity for each of the Build Alternatives.¹ As shown in Table 3.18-A-4, the construction costs were distributed normally over the construction period for each Build Alternative, to estimate the costs of construction in each year and determine the peak year of construction.

Table 3.18-A-4 Build Alternatives Costs Distribution over Construction Period

Build Alternative	Year 1 / 2020	Year 2 / 2021	Year 3 / 2022	Year 4 / 2023	Year 5 / 2024	Year 6 / 2025	Year 7 / 2026	Year 8 / 2027	Year 9 / 2028
Refined SR14	5%	11%	16%	21%	19%	14%	9%	5%	-
SR14A	5%	11%	16%	21%	19%	14%	9%	5%	-
E1	5%	10%	16%	22%	19%	14%	9%	5%	-
E1A	5%	10%	16%	22%	19%	14%	9%	5%	-
E2	4%	10%	16%	22%	19%	13%	7%	5%	4%
E2A	4%	10%	16%	22%	19%	13%	7%	5%	4%

Source: Authority 2020

Note: Maintenance Facility costs are included in percentage estimates.

3 ECONOMIC IMPACTS FROM CONSTRUCTION

This analysis estimates the direct, indirect, and induced employment effects that would occur from the proposed improvements within the Palmdale to Burbank Project Section by applying the RIMS II Type II final-demand multiplier for the construction industry for Los Angeles County to the construction spending estimates. Table 3.18-A-5 presents the estimated total one-time economic impact of construction of the Palmdale to Burbank Project Section on the RSA including total direct, indirect/induced, and peak year direct construction employment estimates. The direct employment for construction is projected at between 5,154 and 6,002 jobs in the peak year 2023, depending on the Build Alternative. Direct employment during construction is estimated to be between 1,400 and 8,000 job-years and indirect/induced annual employment is estimated to be between 1,800 and 10,000 job-years annually, depending on the Build Alternative and construction year.

Table 3.18-A-5 Economic Impact of Construction

Build Alternative/Type of Impact	Employment (Job Years)
Refined SR14	
Direct Impact	37,076
Indirect/Induced Impact	46,274
Total Impact	83,349
<i>2023 Peak Year Direct Jobs</i>	7,786

¹ The construction schedule referenced here is based on the assumed construction schedule provided when the analysis of regional growth impacts was initiated. The construction schedule, however, is subject to change, but the analysis is still accurate in terms of magnitude and context of the impacts.

Build Alternative/Type of Impact	Employment (Job Years)
SR14A	
Direct Impact	37,735
Indirect/Induced Impact	47,097
Total Impact	84,832
<i>2023 Peak Year Direct Jobs</i>	7,924
E1	
Direct Impact	35,755
Indirect/Induced Impact	44,625
Total Impact	80,380
<i>2023 Peak Year Direct Jobs</i>	7,866
E1A	
Direct Impact	36,286
Indirect/Induced Impact	45,288
Total Impact	81,575
<i>2023 Peak Year Direct Jobs</i>	7,983
E2	
Direct Impact	35,987
Indirect/Induced Impact	44,915
Total Impact	80,903
<i>2023 Peak Year Direct Jobs</i>	7,917
E2A	
Direct Impact	36,519
Indirect/Induced Impact	45,579
Total Impact	82,099
<i>2023 Peak Year Direct Jobs</i>	8,034

The Palmdale to Burbank Project Section is just one of several HSR project sections expected to be constructed within a relatively short timeframe and in relative proximity. The RSA for the project includes Los Angeles County, which is also one of the counties in the RSA for both the Bakersfield to Palmdale Project Section and the Burbank to Los Angeles Project Section. The Bakersfield to Palmdale Project Section construction period (2018–2025) and Burbank to Los Angeles Project Section construction period (2020–2025) are anticipated to overlap the construction period anticipated for this project (2020–2028).²

² The construction schedules referenced here are based on the assumed construction schedules provided when the analysis of regional growth impacts were initiated for each project section and as published in EIR/EIS documents. The construction schedules, however, are subject to change.

4 ECONOMIC IMPACTS FROM OPERATIONS

The analysis of operations is based on estimated operating and maintenance costs. In addition, the analysis relies on detailed program data to allocate costs to the Palmdale to Burbank Project Section. Specifically, the analysis used personnel estimates and route miles as the primary metric through which operations costs are allocated from HSR systemwide totals to specific HSR project sections.

In 2040, the Authority anticipates that the total operating budget for the entire HSR system would be approximately \$874 million (2015 dollars); of this amount, about eight percent is attributable to the Palmdale to Burbank Project Section based on track miles, number of stations, and maintenance facilities. The total O&M recurring costs for the project total approximately \$70 million (2015 dollars) (Authority 2017b).³ The operations expenses include regional spending on employee compensation and goods and services. The operations and maintenance employment would include train operations, dispatching, maintenance of equipment, track, and systems, station and train cleaning, and general and administrative positions associated with the tracks, stations in Palmdale and Burbank and rail yards and a Maintenance Facility. Other operating budget costs would involve commercial activities, insurance, and contingency funds. There are no heavy maintenance facilities proposed for the Palmdale to Burbank Project Section. A Maintenance Facility serving the Palmdale to Burbank Project Section would be located in the City of Lancaster.

Table 3.18-A-6 presents the estimated total recurring annual economic impact of the Palmdale to Burbank Project Section operations. The projected level of operations and maintenance activity could be accommodated by existing services industry capacity in the RSA.

Table 3.18-A-6 Regional Projected and Induced O&M Employment Growth

County	2015 Estimate ¹	2040 Projections Baseline ²	HSR Operations and Maintenance Growth ³	Total 2040 HSR Alternative Projections ^{2,3}	O&M Employment Growth ^{2,3}
Los Angeles	4,674,800	5,226,000	490	5,231,383	0.10%

Sources: ¹CDOF, 2016; ²SCAG, 2016; ³Authority and FRA, 2017.

Direct, indirect, and induced employment impacts for the regional growth RSA were calculated by applying RIMS II multipliers to forecasted local O&M expenditures for the project. The direct, indirect, and induced growth³ employment impact associated with O&M of the project would result in an increase of approximately 490 jobs in Los Angeles County. This represents the direct and indirect jobs induced by the project to operate and maintain the Palmdale to Burbank Project Section.

³ As cost estimates are provided in 2015 dollars, O&M RIMS II multipliers would apply without the need to inflate or deflate cost estimates.

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